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UNITED STATES DEPARTMENT OF AGRICULTURE
Rural Electrification Administration
Technical Standards Division

PROPOSED STANDARDIZATION
OF
ELECTRIC CHICK BROODERS AND PIG BROODERS

Based upon Information Submitted by
Thirty-three State Agricultural Colleges and
Two Other Organizations

Compiled by
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United States
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Very truly yours,
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REA STANDARDIZATION POLICY

"The Regulations and Procedure for Technical Standards Committees", approved by Technical Standards Committee "C" July 15, 1942 by virtue of the authority in it vested by General Order #159 issued by Hon. Harry Slattery, Administrator, contain the following statements:

"There is no natural conflict between the interests of reputable manufacturers and those of REA. It is the purpose of REA to secure for its borrowers the best that can be had for the available funds. On the other hand, it is the aim of all reputable manufacturers to develop better products at lower costs. Cooperation of REA engineers with manufacturers' engineers is to the benefit of both rural electrification and the manufacturing industries.

"Unless there is a good reason to the contrary, REA accepts the standards, rules, and regulations of such national bodies as the American Standards Association, the various national engineering societies, the National Electrical Safety Code, and the National Electrical Code.

"REA's standardization of materials and equipment shall never serve to block new developments. On the contrary, REA desires to promote and encourage the development of new devices that will improve service and new methods that will reduce costs without impairing service."

PROPOSED STANDARDIZATION
OF
ELECTRIC CHICK BROODERS AND PIG BROODERS

Based upon Information Submitted by
Thirty-three State Agricultural Colleges and
Two Other Organizations

Compiled by
J. P. Schaenzer, E. C. Meyer, and W. F. Ackerman
Rural Electrification Administration

In an address before the American Society of Agricultural Engineers on December 3, 1941, Mr. M. M. Samuels, Chief, Technical Standards Division, Rural Electrification Administration said in part:

"A visit to various agricultural colleges brought out the fact that many competent and serious-minded men, working under great handicaps, have developed some fine and useful equipment only to be discouraged because they could not interest any manufacturer to put it into production so that every farmer in the country could get the benefit of it. The best they could do was to send a set of prints or a booklet to the individual farmer and invite him to build it himself. However, if a farmer were to build himself all the gadgets for which instructions are sent to him, he would have little time for farming. But what else could those hard working, competent men of science do? The electric brooder will serve as a good illustration. At every agricultural college visited, someone had a new electric brooder which he considered superior to any other. Practically every agricultural engineer I met outside the colleges likewise had a new brooder, better than all others. In one of the colleges, when I was introduced to the professor, I asked him off-hand to show me his new electric brooder. His surprised reply was: 'How did you know that I had one?' Now each of these men has the welfare of the chicken sincerely at heart. Every one undoubtedly made some real worth-while improvement. All these improvements combined, should result in a range of standardized brooders that will meet practically all conditions." (1)

Such standardization would be of value in reducing brooder costs during normal times and would during this emergency enable a maximum increase in poultry and pork production without excessive use of critical materials. If interested manufacturers were guided by standards established from a consensus of experts, they could go into quantity production of several sizes designed to most nearly fulfill the requirements of the particular equipment.

- (1) New Engineering and a New Industry by M. M. Samuels, Electrical Engineering, October 1942.

To establish these requirements a questionnaire (1) was submitted by REA to the Agricultural Engineering, Poultry Husbandry, and Animal Husbandry professors of 33 State Agricultural Colleges and two other organizations.

Replies from all these have shown a marked interest in brooding problems. Of the 35 replies, 26 sent definite plans for either an indoor or outdoor type chick brooder, or both. Several recommended plans of brooders used in other states. Since these plans are for home-made brooders, they generally indicate an attempt toward simplification, even though possibly sacrificing some desirable features.

Twelve states either have plans, or recommend plans of other institutions for outdoor type chick brooders. There is little information available for outdoor brooders on which to base recommendations, except in a general way. However, it is interesting to note that most of these have been or can be converted to electric from the former oil lamp types. Regarding metals, these brooders require considerably more than indoor types.

Plans or recommendations have been received from 22 states for indoor type brooders. Thirteen of these use either Mazda or R-40 type lamps, two iron wire, and the remaining seven commercially manufactured heating elements.

Capacities of Indoor Brooders in Terms of Number of Chicks

Plans were submitted for several sizes of brooders, indicating a desire to fulfill the needs of all poultry raisers. Many states have plans for more than one size. A tabulation of the sizes follows for both lamp and heating element types. The latter include iron wire, and all types of nichrome units.

<u>Brooder Size</u> <u>No. of Chicks</u>	<u>Number of Plans Reported</u>	
	<u>Lamp Type</u>	<u>Element Type</u>
0 - 100	6	3
100 - 200	3	4 3
200 - 300	11	6 7
300 - 400	1	4
400 - 500	1	2
500 - 600	None	1

It is apparent that most emphasis is placed on sizes of flocks ranging from 200 to 400 chicks, but it is also clear that brooding provision must be made for smaller flocks. Therefore, if standards are to be prepared for brooders, small capacity ones must be included. It is interesting to note the capacity limitations of lamp types as compared to element types.

Wattage Installed

The various institutions generally recommend a minimum wattage for a particular brooder size. This minimum requirement in watts varies somewhat. The range

(1) Budget Bureau No. 40-4362

for different sizes falls within certain limits as shown in the following tabulation:

Brooder Size No. of Chicks	Number of Watts	
	Lamp Type	Element Type
0 - 100	150 - 250	165 - 220
100 - 200	300 - 400	330 - 900
200 - 300	300 - 600	300 - 650
300 - 400	300 (one case only)	425 - 1000
400 - 500	450 " " "	600 - 1000

Many institutions recommend specific sizes of lamps at the start of the brooding season with changes to smaller sizes as the season progresses. Factors such as ambient temperature, insulation of the brooder, and temperature control determine the wattage of the heat source, thus accounting for wide variations. Apparently no definite correlation exists between the capacity of brooder and wattage per chick. It might be noted that wattages for element and lamp-type brooders for a particular size are approximately the same.

Brooder Area Per Chick

The minimum brooder area per chick remains practically constant for brooders of from 300 to 500 chick capacity, as shown by the following table:

Brooder Size No. of Chicks	Square Inches per Chick	
	Range	Average
0 - 100	7.7 - 13.0	11.2
100 - 200	7.4 - 14.4 9.2	9.0 8.4
200 - 300	7.7 - 11.5	9.7
300 - 400	6.7 - 9.0	7.7
400 - 500	6.9 - 7.7	7.3

Brooder Insulation

The importance of insulation, according to replies received, is evidently still a very much debated subject as it concerns the 13 lamp brooders. ~~Eight~~ ^{nine} institutions indicate the use of litter, usually four inches on top of the brooder is considered sufficient, while two specify commercial types of insulation. Of the eight specifying heating elements, five indicated the use of commercial insulation as desirable, while only three specified litter. Undoubtedly attempts to simplify home-made brooders, and the tendency to follow a design similar to that of the Ohio State University unit, have led to the elimination of commercial insulation.

Ventilation

Auxiliary ventilation is not recommended for the thirteen electric lamp brooders. However, those equipped with heating elements often have fans in combination. Several institutions recommend or suggest the use of a gravity vent pipe or flue.

Curtain

The trend is to eliminate the curtain around the sides of the brooder, but five of the eleven advocates of lamp brooders still specify it, and others indicate that it may be used under severe temperature conditions. For the heating element type, a curtain is specified in most cases.

Temperature Control

The use of an automatic temperature control device is also a much debated subject. Most institutions agree that a thermostat will reduce energy consumption. Four of these recommend the installation of a thermostat in the lamp brooder, while two make it optional. All brooders using a heating element are equipped with a thermostat.

It is generally agreed that the action of the chick is the best guide as to the correct temperature to be used, and, if necessary, lamps of different sizes can be installed when the chicks crowd each other or lie outside of the brooder. Uniformity of temperature is not stressed. A general recommendation is to have a temperature of 95 F to 100F for starting the chicks. No indication is given as to where the temperature should be measured.

OUTDOOR TYPE BROODERS

Plans for outdoor types of brooders were submitted by seven State Agricultural Colleges. Lack of information on which to base recommendations regarding this type of brooder prevents any attempt at standardization at this time. However, some features of these brooders seem to be common to all plans submitted.

Most of these brooders are of small capacity, accommodating about 50 to 60 chicks. The brooder is approximately three by four feet in size, is insulated has a sloping roof, is provided with an inspection window and uses Mazda lamps as a source of heat. Attached to the brooder and separated from it only by a curtain or sliding door, is a runway where the chicks can get sunlight and be kept off the ground. These runways vary in size, averaging three feet by six feet. The floor is usually covered with hardware cloth and the sides with mesh poultry netting.

11/11/11

Dear Sir,
I have the honor to acknowledge the receipt of your letter of the 10th inst. in relation to the above mentioned matter.

Very respectfully,
J. H. [Name]

I have also the honor to acknowledge the receipt of your letter of the 11th inst. in relation to the above mentioned matter. I am sorry that I cannot give you a more definite answer at this time, but I will endeavor to do so as soon as possible.

I am, Sir, very respectfully,
Your obedient servant,
J. H. [Name]

Very truly,
J. H. [Name]

I have the honor to acknowledge the receipt of your letter of the 12th inst. in relation to the above mentioned matter. I am sorry that I cannot give you a more definite answer at this time, but I will endeavor to do so as soon as possible.

I am, Sir, very respectfully,
Your obedient servant,
J. H. [Name]

INDOOR CHICK BROODER CONSTRUCTION RECOMMENDATIONS
Based on Replies Received in Response to REA Questionnaire

1. Proposed Brooder Sizes:

<u>Brooder Size</u> <u>No. of Chicks</u>	<u>Dimensions</u> <u>(Inches)</u>	<u>Lamps</u>		
		<u>No.</u>	<u>Watts</u>	<u>Type</u>
50 - 100	36 x 36	4	50	Mazda or equiv.
100 - 150	42 x 42	4	100	" " "
150 - 250	48 x 48	4	150	R - 40 "
250 - 350	48 x 72	4	200	R - 40 "

2. Area per chick: A minimum of nine square inches per chick should be provided for each size brooder.
3. Wattage per chick: A minimum of 2.0 watts per chick should be provided, based upon maximum brooder capacity.
4. Ambient Temperature Variation: Size of lamps may be varied depending on heat requirement.
5. Temperature Control: Two lamps on opposite sides of the brooder shall be controlled by a thermostat and the other two wired for continuous operation.
6. Heat source: For the smaller sizes, 115-volt Mazda lamps or equivalent are used as the source of heat. For the larger sizes, R-40 lamps or equivalent are recommended. They may be projector floods, reflector floods, or drying lamps of 150-, 200-, or 250-watts each. Only lamps having at least a 1000-hr life should be used.
7. Thermostat: A thermostatic switch of the wafer-type or equivalent should be provided. This switch should be capable of controlling incandescent lamp loads. It should be placed so as to maintain the temperature near the controlled lamp within a range of 5° F.
8. Curtain: A curtain should be provided on all four sides. It must be hemmed on the bottom edge.
9. Hover Construction:
 - a. The design should follow the general pattern of the brooder developed by Ohio State University. This provides for a flat roof with the sides of the brooder extending at least four inches above it to allow for litter insulation. The same design and overall dimensions will apply if manufactured as a stamped metal product. Note: A non-combustible insulating material should be used, if available.
 - b. All material used in the construction of the broode should be of sufficient size and strength to provide for sturdiness and long life.

- c. Adjustable legs should be provided to allow for changing the height of the opening. An alternate method, such as a rope, pulley and counter-weight may be used.
 - d. All wood and other materials, when necessary, must be protected by a suitable paint or other finish.
10. Brooder Cord: The brooder cord shall be heavy duty rubber-covered Type SJ with at least Number 16 size wire or PWP-32 for war emergency. WPB order R-1 amended June 1, 1943.
11. Underwriters' Approval: All electrical parts must be of a type approved by the Underwriters' Laboratories and all wiring installations must conform to the National Electrical Code.

FEATURES OF HOME-MADE CHICK BROODERS

Recommended by Various State Agricultural Colleges

State	Brooder Size No. of Chicks	Heat Source	Watts per Chick		Sq. Inches per Chick		Insulation	Ventilation	Curtain	Temperature Control
			Max	Min	Max	Min				
Calif.	75 - 100 25 - 50	Lamps	3.0 6.0	2.3 3.0	17.0 23.0	13.0 11.0	$\frac{1}{8}$ " Celotex	No	Yes	Change Lamps
Conn.	65 100 150 200 250	Lamps	2.3 2.0 2.0 2.0 2.0	0.9 1.0 0.8 1.0 1.2	8.8 9.0 8.6 8.0 9.2		4" litter Insulation board may be used	No	Yes	Thermostat may be used
Idaho	75 175 225 300 450 600	Comm. element	3.2 2.2 2.0 2.0 1.8 1.6	2.2 2.0 1.6 1.6 1.3 1.3	7.7 7.4 7.7 7.7 7.7 7.7		Insulation board	Fans various means	Yes	Thermostat
Ill.	Recommending Ohio Type									
Ind.	200 - 350 300 - 500	Reflector flood lamps Reflector flood lamps	1.5 1.5	0.9 0.9	11.5 11.5	6.7 6.9	Litter	No	No	Change Lamps
Iowa	500	Comm. element	2.0		7.0		Air Space (False roof)	Eaves Spout	No	Thermostat
Ky.	Recommending Ohio Type									

State	Brooder Size No. of Chicks	Heat Source	Watts per Chick		Sq. Inches per Chick		Insulation	Ventilation	Curtain	Temperature Control
			Max	Min	Max	Min				
Miss.	250	Heating Element #20B&S	2.6		9.2		1" Celotex	Vent pipe	Yes	Thermostat
Mo.	250	Lamps, Screw base heaters	1.2		9.2		4" ground corn-cobs etc.	No	No	Thermostat
Nebr.	100 - 150	Lamps	3.0	1.6	11.6	7.7	Shavings or litter	No	No	No
N. H.	350	Open coil	1.2		7.0		None	Fan	Double	Thermostat
N. J.	200 - 250 250 - 300	Lamps	2.0 1.3	1.6	11.8 13.8	9.2 11.5	Litter Corn-cobs	No	No	No
N. C.	300 - 400	Comm. element			12.0	9.0	1" wallboard and litter	Fan	Yes	Thermostat
Ohio	200 - 250 250 - 300	Lamps	2.0 1.6	1.6 1.3	11.8 13.8	9.2 11.5	None	No	Rec.	No
Ore. #1a b #2 #3	50 50 200 300	Lamps Lamps Iron wire Comm. element	5.0 4.0 4.5		11.5 11.0 11.0 12.0		2" litter 2" litter 2" litter Corrugated paper or 1" insul.	No No No Fan	No No No Yes	Yes No Thermostat Thermostat
Fa.	200 - 250	Lamps	3.0	2.4	11.5	9.5	25/32" sheath-No ing and litter		Yes	Thermostat

State	Brooder Size No. of Chicks	Heat Source	Watts per Chick Max Min	Sq. Inches per Chick Max Min	Insulation	Ventilation	Curtain	Temperature Control
Tenn.	100 - 200	Comm. element	2.2 2.2	11.0 8.4	Sawdust	No	Yes	Thermostat
Tex. #1	100	Mazda lamps	2.5 1.5	10.0	Two layers heavy card- board		Yes	Thermostat
#2	100	Comm. element				Fan		Thermostat
#3	350	Comm. element				Fan		Thermostat
#4		Ohio design						
Va.	75 - 100	Comm. element	3.0 2.2	11.2 8.4	Celotex	No	Yes One Side	Thermostat
	125 - 150	Comm. element	2.6 2.2	9.2 7.7	Celotex	No	One Side	Thermostat
Wash.	250 160	Iron wire	2.6 4.0	9.2 14.4	<i>Litter</i> Building Paper	No	No	Thermostat
Wis.	300 - 350	Comm. element	3.3 2.8		Litter	Fan	Double	Thermostat

PIG BROODERS

Eight State Agricultural Colleges submitted pig brooder plans of their own. Others stated that they are recommending plans developed by other institutions. The similarity of plans submitted makes standardization comparatively easy.

The source of heat is a Mazda lamp, seven recommending a 150-watt bulb and one a 100-watt. A reflector 12" to 16" in diameter is used to direct the heat of the lamp downward. One recommends a home-made square reflector. The reflector rests on the flat top of the brooder. A hole, slightly smaller than the reflector, is cut in the top and covered with hardware cloth. The lamp is screwed into a molded composition socket such as bakelite or porcelain, which is attached to a dropcord.

The brooder is of triangular shape to fit into a corner of the farrowing pen. The length of the sides recommended vary from three to four feet. One-inch lumber is used. The same overall dimensions will apply if manufactured as a stamped metal product. The front opening is about seven inches high.

FEATURES OF HOME-MADE PIG BROODERS Recommended by Various State Agricultural Colleges

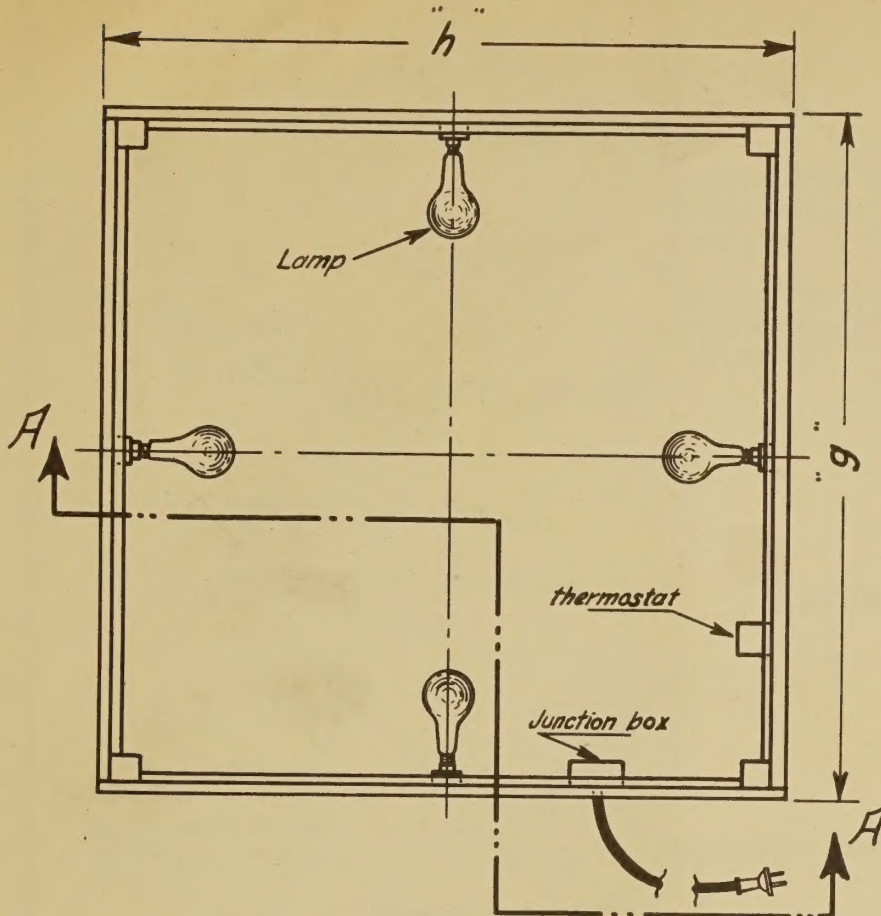
	<u>Reflector Size</u> <u>Inches</u>	<u>Lamp Size</u> <u>Maximum Wattage</u>	<u>Length of Sides</u> <u>Inches</u>	<u>Special</u> <u>Features</u>
Connecticut	14 - 16	150	28	_____
Idaho (1)	12	150	48	Insulation surrounding reflector
Indiana (Purdue)	14	150	42	_____
Iowa	16	100	36	Curtain for severe weather
Michigan	14	150	36 - 42	_____
Tennessee	—	150	42	_____
Washington (2)	14 - 16	150	36 - 42	_____
Wisconsin	—	150	36	Curtain may be used.

Note (1) Also has plans for strip-heater brooder.

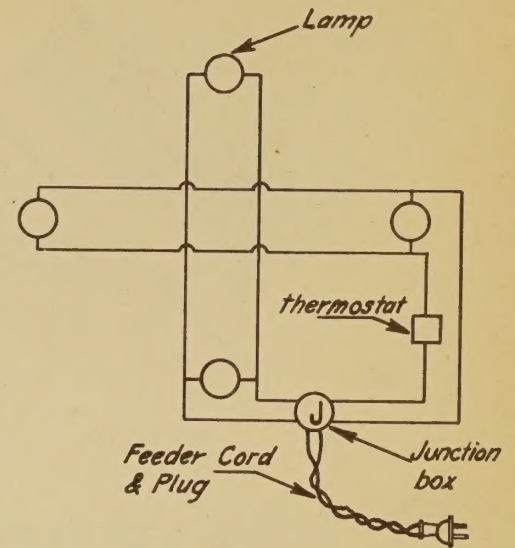
(2) Alternate plan using 2 sixty-watt bulbs with full-length reflector and box to cover it.

AN ELECTRIC CHICK BROODER

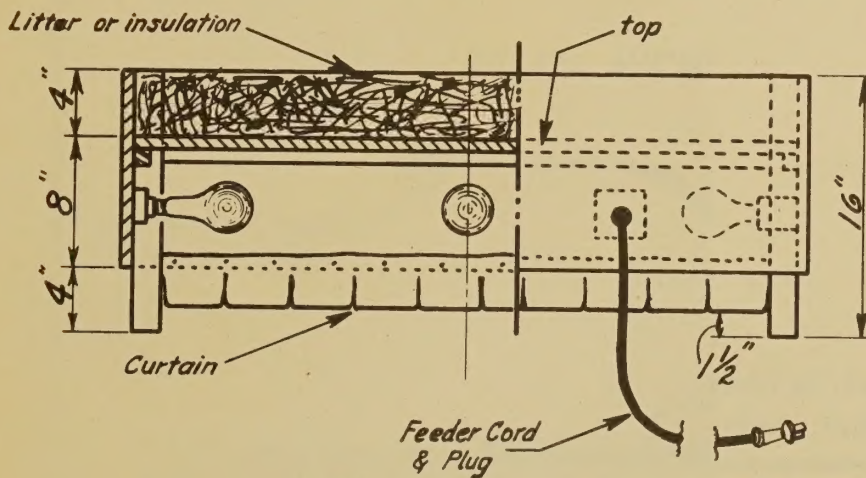
ESSENTIAL FEATURES DERIVED FROM PLANS SUBMITTED BY
STATE AGRICULTURAL COLLEGES AND OTHER ORGANIZATIONS



Plan View with Top removed



Schematic
Wiring Diagram

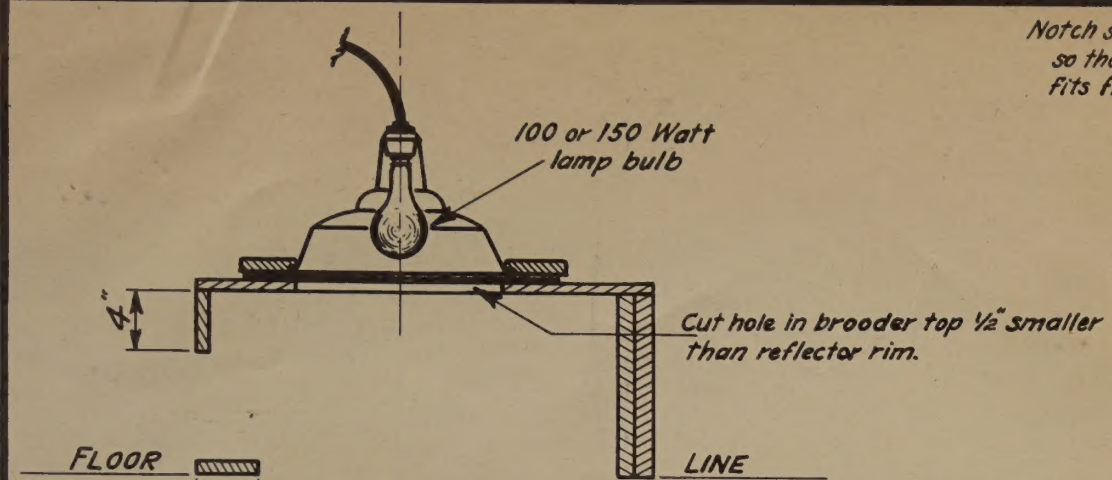


Section on A-A

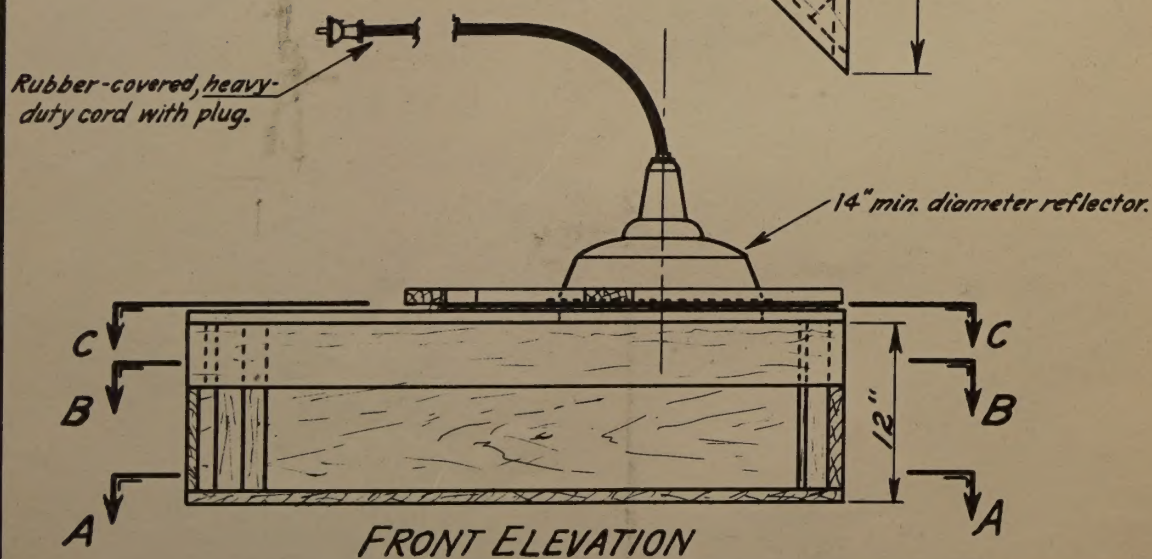
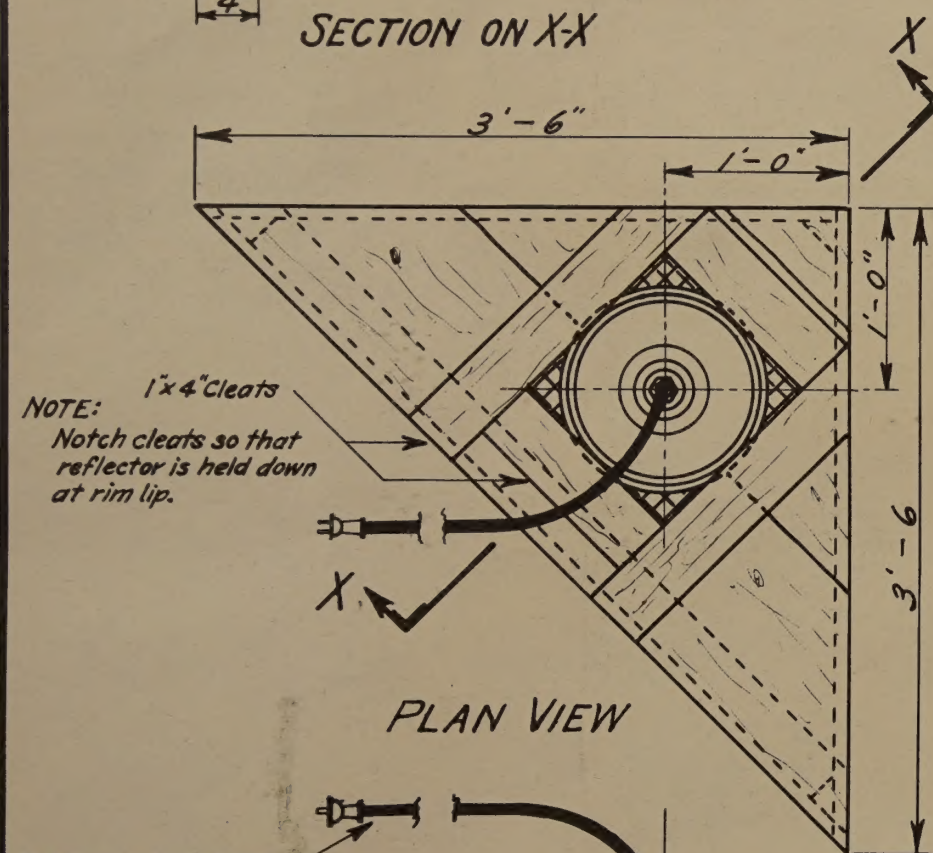
1. Dimensions of brooder:

CHICK CAPACITY	DIMENSION "g"	DIMENSION "h"
50 - 100	36"	36"
100 - 150	42"	42"
150 - 250	48"	48"
250 - 350	72"	72"

- Heat source: Appropriate sizes of Mazda or R-40 lamps or their equivalent.
- All electric installations must comply with the National Electrical Code.



SECTION ON X-X



Notch side-uprights so that front piece fits flush.

2" reinforcing strip

SECTIONAL VIEW AT B-B

Notch bottom of side up-rights so slat across bottom fits flush.

2" reinforcing strip.
Also facilitates assembly nailing.

SECTIONAL VIEW AT A-A

Hardware cloth

Hardware cloth & reflector held in place by cleats, as shown in plan view.

Fasten cleats to brooder top by wood screws for easy removal of reflector and hardware cloth.

SECTIONAL VIEW AT C-C

This design based on 1" lumber unless otherwise noted.

NOTE:
Essential features of this brooder were derived from Plans submitted by State Agricultural Colleges.

U.S. DEPT OF AGRICULTURE
RURAL ELECTRIFICATION ADMINISTRATION

ELECTRIC PIG BROODER

Scale: 1"=1'-0"

Date: Apr. 18, '44

Technical Standards Division: - B 2606

